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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Application Number: 10/712,685
Filing Date: November 13, 2003
Appellant(s): FREYDINA ET AL.

Lowrie, Lando & Anastasi, LLP
For Appellant

EXAMINER'S ANSWER

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This is in response to the appeal brief filed December 17, 2007 appealing from the Office action mailed May 16, 2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is substantially correct. Paragraph A should state that Claims 1,3,8-10 and 12 are rejected over Hark patent 4,808,287 in view of Batchelder et al patent 6,126,805, instead of "Claims 1-3, ...". Including claim 2 in the claims rejected in the Final Office Action was clerical error on the part of the Office, since claim 2 had been previously canceled. Paragraph B rejecting Claims 11,12,13 and 27 over Hark in view of Batchelder and Rela patent 6,607,668 does not correspond to the Final Office Action which only rejected Claim 19 over this Grouping of references. Regardless, no Claims remain rejected over this grouping of references in this Examiner's Answer and any rejection over this grouping of references is extraneous to the Rejection of Paragraph C rejecting Claims 4-7,11-20,22 and 27-32 over Hark in view of Batchelder and further in view of both Rela patent 6,607,668 and Tamura et al patent 6,303,037, which is consistent with both the final Office Action and with the Grounds of Rejection in this Examiner's Answer.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. Grounds A. and C. are correct and correspond with the Final Office Action and the Grounds of Rejection in this Examiner's Answer. Ground B. is now extraneous to Ground C, since no claims remain rejected over the particular grouping of references "Hark in view of Batchelder and Rela".

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,607,668	RELA	8-2003
6,303,037	TAMURA ET AL	10-2001
6,126,805	BATCHELDER ET AL	10-2000
4,808,287	HARK	2-1989

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hark patent 4,808,287 in view of Batchelder et al patent 6,126,805. Hark discloses a system for producing treated water comprising introduction of a municipal water supply stream into a point of entry that may be considered to be the inlet to prefiltration unit 1, intermediate treatment means of carbon filters and reverse osmosis units, and removal of undesirable species in electrochemical device or electrodialysis (EDI) unit 9. It is stated that the voltage is controlled by and electric current periodically reversed for the purpose of cleaning off contaminants that deposit on the electrodes (column 4, lines 38-50). Treated water is then distributed to points of use through pumps 23 and 25. Hark additionally discloses storing the water in reservoirs 22

and/or 24, thus having a "reservoir system" that encompasses the storage reservoirs and points upstream including connecting conduit 17 and upstream reverse osmosis units 6 and 7 and pressurizing pumps 5 and 8.

The claims all differ in requiring that the electrical current is maintained below a limiting current density to suppress hydroxyl ion generation. Batchelder teaches that EDI-containing water treatment systems are operated near or below the limiting current density, sometimes in combination with reversal of direction of the electric current (as in Batchelder) in order to mitigate the precipitation and deposition of minerals to contact surfaces (column 1, line 62-column 2, line 19 and column 4, line 42-column 5, line 2, etc.) Such actions are taught as reducing "water splitting" or formation of hydroxyl ions. It is noted that the water treated by Hark contains minerals among other contaminants (Hark at column 2, lines 33-45). More specifically, in column 8, lines 34-47 and column 12, lines 35-38 and 45-51, Batchelder explicitly teaches operating the anion exchange membranes of an electrodialysis or electrodeionizing device to have a reduced water-splitting capacity and to operate the cation exchange membranes of such device to have a relatively limited water-splitting capacity compared to enhanced water splitting membranes, with such objectives realized by limiting current densities [as required by claim 3].

Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces and downstream of the device especially in the concentrating stream, so as to optimize the EDI operation in removal of salts and other contaminants.

Batchelder also teaches that current densities achievable are necessarily limited by operating parameters of the EDI unit including thickness, structure of and diffusion rates through the membranes of the EDI unit and salt concentrations (column 1, lines 38-67). Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces, so as to optimize the EDI operation in removal of salts and other contaminants. It would have also been obvious that the EDI unit of Hark is only operable only at current densities up to a given limit, depending upon parameters of the construction and configuration of the EDI unit, as taught by Batchelder, thus water-splitting or hydroxyl ion generation is inherently "suppressed" or limited to a given extent.

It is noted that neither any of the claims, or the specification, quantify, or define a specific degree of hydroxyl ion suppression or quantify or recite a range of current density or limiting current density.

For claim 3, Batchelder teaches to apply an electrical current having a current density below a maximum limiting current density (column 1, line 62-column 2, line 19 and column 4, line 42-column 5, line 2, etc.).

For claims 8 and 9, the treated water is stored in reservoirs 22 and 24 under some degree of pressure and are thus pressurized , by way of pressure imparted by upstream pumps 7 and 19-21 and the reservoirs or tanks being maintained full of water (Hark at column 5, lines 44-46).

For claim 10, Hark discloses EDI device units 1 and 2 (see figure).

Claims 4-7, 11-20, 22 and 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hark in view of Batchelder and additionally in view of Tamura et al patent 6,303,037 and Rela patent 6,607,668.

Claims 4-7 further differ in requiring measuring of at least one water property in the reservoir system. Rela discloses a process combining activated carbon, reverse osmosis and EDI water treatment units, effective to reduce level of all impurities by a factor of approximately 700 upstream of the electrochemical device, resulting in water having very high resistance or very low conductivity (column 11, lines 54-65 and column 12, lines 8-12, respectively).

In Rela, various water properties are sensed/measured (pressure at column 6, lines 16-18, flow rate at column 6, lines 65-67 and ionic concentrations and temperatures in the feed water and throughout the system at column 8, lines 55-64 and sensed values are used by controllers to control flow rates of raw water, flow rates of the water being distributed to end use points, amount of current applied to the electrodeionization device and other system parameters (col. 4, l 43-67, col. 10. l 28-40, column 11, lines 7-57).

Tamura teaches water treatment system including activated carbon and other pre-filters and reverse osmosis treatment units in which water properties of pH are sensed (column 6, lines 23-37).

In summary, it would have been also obvious to one of ordinary skill in the art to have incorporated the monitoring and control taught by Rela and Tamura, into the Hark system, so as to optimize overall performance of the water treatment system including maintaining optimum flux and performance through the reverse osmosis units. Another motivation is to facilitate prompt and efficient maintenance and maintenance schedules for the various water treatment components.

For claim 5, Rela also measures or monitors the water quality of water exiting the EDI unit with monitor 66 and in response calculates and adjusts the voltage and current of the EDI unit (column 10, lines 21-27).

For claim 6, the discharge pumps 23 and 25 and downstream user stations (figure) constitute distribution of treated water to a point of use. Rela suggests that such distribution is interrupted when necessary for EDI maintenance when monitoring deems necessary (column 10, lines 44-46).

For claim 7, Rela adjusts flow rates with control valves (column 10, lines 35-36).

With regard to claim 11, Hark discloses a system for producing treated water comprising introduction of a municipal water supply stream into a point of entry that may be considered to be the inlet to prefilter 1, intermediate treatment means of carbon filters and reverse osmosis units, and removal of undesirable species in electrodialysis (EDI) unit 9. It is stated that the voltage is controlled by a controller and electric current periodically reversed for the purpose of cleaning off contaminants that deposit on the electrodes (column 4, lines 38-50). Treated water is then distributed to points of use through pumps 23 and 25. Hark additionally discloses storing the water in reservoirs 22 and/or 24, thus having a "reservoir system" that encompasses the storage reservoirs and points upstream including connecting conduit 17 and upstream reverse osmosis units 6 and 7 and pressurizing pumps 5 and 8.

Claim 11 and claims dependent therefrom all differ in requiring that the electrical current is maintained below a limiting current density to suppress hydroxyl ion generation. Batchelder teaches that EDI-containing water treatment systems are operated near or below the limiting current density, sometimes in combination with reversal of direction of the electric current (as in Batchelder) in order to mitigate the precipitation and deposition of minerals to contact surfaces (column 1, line 62-column 2, line 19 and column 4, line 42-column 5, line 2, etc.) Such actions are taught as reducing "water splitting" or formation of hydroxyl ions. It is noted that the water treated by Hark contains minerals among other contaminants (Hark at column 2, lines 33-45). More specifically, in column 8, lines 34-47 and column 12, lines 35-38 and 45-51, Batchelder explicitly teaches operating the anion exchange membranes of an electrodialysis or electrodeionizing device to have a reduced water-splitting capacity and to operate the cation exchange membranes of such device to have a relatively limited water-splitting capacity

compared to enhanced water splitting membranes, with such objectives realized by limiting current densities.

Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces and downstream of the device especially in the concentrating stream, so as to optimize the EDI operation in removal of salts and other contaminants.

Batchelder also teaches that current densities achievable are necessarily limited by operating parameters of the EDI unit including thickness, structure of and diffusion rates through the membranes of the EDI unit and salt concentrations (column 1, lines 38-67). Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces, so as to optimize the EDI operation in removal of salts and other contaminants. It would have also been obvious that the EDI unit of Hark is only operable only at current densities up to a given limit, depending upon parameters of the construction and configuration of the EDI unit, as taught by Batchelder, thus water-splitting or hydroxyl ion generation is inherently "suppressed" or limited to a given extent.

It is noted that neither any of the claims, or the specification, quantify, or define a specific degree of hydroxyl ion suppression or quantify or recite a range of current density or limiting current density.

Also with regard to claim 11 and claims that depend therefrom, Hark discloses storing of water between the point of entry (inlet to prefiltration unit 1) and the portion of the system encompassing the reverse osmosis units and the EDI Units 1 and 2, by providing solenoid valve 33 that opens and closes to prevent water flow downstream towards these units, and storing water within chambers and sumps of upstream filter chambers 1,2,3 and 4 and connecting conduits (figure, column 2, lines 41-50 and column 5, lines 8-15). Claim 11 and claims dependent therefrom differ in requiring such storage to comprise at least one reservoir. However, Rela teaches at least one reservoir tank 12 that is upstream of reverse osmosis module 46 and EDI module 54 and other pre-treatment units and Tamura teaches a discrete storage reservoir tank 3 that is fluidly coupled between an upstream pretreatment activated carbon module 2 and downstream feed pump 5 and reverse osmosis unit 6 (figure 2 and column 4, line 55-column 5, line 4). It would have been obvious to have facilitated the storing of water upstream of the reverse osmosis and EDI units or modules that occurs in Hark, by providing a reservoir tank, as taught by Rela and Tamura, in order to facilitate maintaining of optimum pressures upstream of the reverse osmosis units , for efficient operation of the reverse osmosis module units, and assure accurate pump discharge and pressure conditions (column 3, lines 10-23 of Hark).

For claim 12, the tank 3 of Tamura would inherently store water as well as provide a flow path for the water being treated.

For claim 13, Tamura indirectly senses a water property of the reservoir tank, it's pH, by sensing the pH level just upstream of the tank in conduit 9 with sensor 13 (column 5, lines 14-18 and figure 2).

For claim 14, Rela also measures or monitors the water quality of water exiting an EDI unit with monitor 66 and in response calculates and adjusts the voltage and current of the EDI unit (column 10, lines 21-27).

For claim 15, Rela adjusts flow rates with control valves (column 10, lines 35-36).

For claim 16, the discharge pumps 23 and 25 and downstream user stations (figure) of Hark constitute distribution of treated water to a point of use.

For claim 27, which depends from claim 11, in Rela, treated and recycled water is mixed with water from the point of entry (upstream of pre-filtration unit 1) between activated carbon filter 2 and carbon filter 3.

With regard to claim 17, Hark discloses a system for producing treated water comprising introduction of a municipal water supply stream into a point of entry that may be considered to be the inlet to prefilter 1, intermediate treatment means of carbon filters and reverse osmosis units, and removal of undesirable species in electrochemical, electrodialysis (EDI) unit 9. It is stated that the voltage and power from a "power supply" are controlled by a potentiometer and electric current periodically reversed for the purpose of cleaning off contaminants that deposit on the electrodes (column 4, lines 38-50). Treated water is then distributed to points of use through pumps 23 and 25. Hark additionally discloses storing the water in reservoirs 22 and/or 24, thus having a "reservoir system" that encompasses the storage reservoirs and points upstream including connecting conduit 17 and upstream reverse osmosis units 6 and 7 and pressurizing pumps 5 and 8. Both the EDI unit and reverse osmosis units are fluidly connected to points upstream and point of entry by intervening conduit 17 and intervening water treatment units 1-4 and by pumps 5 and 7. The reservoir system comprises "a plurality of zones of different water

quality levels, in that an arbitrary zone encompassing storage reservoir 24 has a higher water quality than another zone encompassing storage reservoir 22, since the water entering reservoir 24 has been additionally treated with ultra-violet sterilization.

Claim 17 and claims dependent therefrom all differ in requiring that the electrical current is maintained below a limiting current density to suppress hydroxyl ion generation. Batchelder teaches that EDI-containing water treatment systems are operated near or below the limiting current density, sometimes in combination with reversal of direction of the electric current (as in Batchelder) in order to mitigate the precipitation and deposition of minerals to contact surfaces (column 1, line 62-column 2, line 19 and column 4, line 42-column 5, line 2, etc.) Such actions are taught as reducing "water splitting" or formation of hydroxyl ions. It is noted that the water treated by Hark contains minerals among other contaminants (Hark at column 2, lines 33-45). More specifically, in column 8, lines 34-47 and column 12, lines 35-38 and 45-51, Batchelder explicitly teaches operating the anion exchange membranes of an electrodialysis or electrodeionizing device to have a reduced water-splitting capacity and to operate the cation exchange membranes of such device to have a relatively limited water-splitting capacity compared to enhanced water splitting membranes, with such objectives realized by limiting current densities.

Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces and downstream of the device especially in the concentrating stream, so as to optimize the EDI operation in removal of salts and other contaminants.

Batchelder also teaches that current densities achievable are necessarily limited by operating parameters of the EDI unit including thickness, structure of and diffusion rates through the membranes of the EDI unit and salt concentrations (column 1, lines 38-67). Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces, so as to optimize the EDI operation in removal of salts and other contaminants. It would have also been obvious that the EDI unit of Hark is only operable only at current densities up to a given limit, depending upon parameters of the construction and configuration of the EDI unit, as taught by Batchelder, thus water-splitting or hydroxyl ion generation is inherently "suppressed" or limited to a given extent.

It is noted that neither any of the claims, or the specification, quantify, or define a specific degree of hydroxyl ion suppression or quantify or recite a range of current density or limiting current density.

Claim 17 and claims dependent therefrom, also differ in requiring that the regulating of electrical current of the EDI unit is regulated by a "controller". Rela teaches a water treatment system encompassing pretreatment filters comprising activated carbon filter or other sediment prefilter 10, reverse osmosis module 46 and electrochemical (EDI) unit 56, in which there is a controller or "control system" controlling the various water treatment units and also operative to regulate the current and power to the EDI unit (column 10, lines 18-28 and column 11, lines 7-57). Tamura teaches a controller to regulate feeding of chemicals to a reverse osmosis water treatment system (column 2, lines 60-62, etc.). Hark also discloses addition of treatment chemicals through chemical adding means 19, 20 and 21 proximate reverse osmosis and EDI treatment units. It would have been further obvious to one of ordinary skill in the art to have included a controller for regulating addition of water treatment chemicals, operation of the reverse osmosis water treatment unit and EDI unit , as taught by Rela and Tamura et al, so as to operate the EDI unit and reverse osmosis filter units to provide optimal water quality and optimal operation.

For claim 18, the discharge pumps 23 and 25 and downstream user stations (figure) of Hark constitute distribution of treated water to a point of use.

For claim 19, Rela also measures or monitors the water quality of water exiting an EDI unit with monitor or sensor 6 and in response calculates and adjusts the voltage and current of the EDI unit (column 10, lines 21-27).

For claim 20, Hark provides EDI units 1 and 2 downstream of reverse osmosis units.

For claim 29, that depends from claim 17, water in the reservoir system of Hark is pressurized by way of pressure pumps 5 and 7.

For claim 30, depending from claim 29, Rela teaches a controller that regulates flow through the EDI unit and on towards points of use downstream (column 10, lines 28-42).

For claim 31, also dependent from claim 17, Rela teaches monitoring, inherently receiving signals, from monitor 66 in a zone proximate or including the EDI unit, and regulating electrical current based on the monitoring (column 10, lines 18-27).

Regarding claim 22 and claims dependent therefrom, Hark discloses a system for producing treated water comprising introduction of a municipal water supply stream into a point of entry that may be considered to be the inlet to prefiltration unit 1, intermediate treatment means of carbon filters and reverse osmosis units, and removal of undesirable species in downstream electrochemical device or electrodialysis (EDI) unit 9. It is stated that the voltage is controlled by and electric current periodically reversed for the purpose of cleaning off contaminants that deposit on the electrodes (column 4, lines 38-50). Treated water is then distributed to points of use through pumps 23 and 25. It is stated that the voltage and power from a "power supply" are controlled by a potentiometer and electric current periodically reversed for the purpose of cleaning off contaminants that deposit on the electrodes (column 4, lines 38-50).

Also with regard to claim 22 and claims that depend therefrom, Hark discloses a system for storing of water between the point of entry (inlet to prefiltration unit 1) and the downstream portion of the system that encompasses the reverse osmosis units and the EDI Units 1 and 2, by providing solenoid valve 33 that opens and closes to prevent water flow downstream towards these units, and stores water within chambers and sumps of upstream filter chambers 1,2,3 and 4 and connecting conduits (figure, column 2, lines 41-50 and column 5, lines 8-15). Claim 22 and

claims dependent therefrom differ in requiring such storage system to comprise at least one reservoir. However, Rela teaches at least one reservoir tank 12 that is upstream of reverse osmosis module 46 and EDI module 54 and other pre-treatment units and Tamura teaches a discrete storage reservoir tank 3 that is fluidly coupled between an upstream pretreatment activated carbon module 2 and downstream feed pump 5 and reverse osmosis unit 6 (figure 2 and column 4, line 55-column 5, line 4). It would have been obvious to have facilitated the system for storing of water upstream of the reverse osmosis and EDI units or modules that occurs in Hark, by providing a reservoir tank, as taught by Rela and Tamura, thus providing Rela with a "reservoir system", in order to facilitate maintaining of optimum pressures upstream of the reverse osmosis units, for efficient operation of the reverse osmosis module units, and assure accurate pump discharge and pressure conditions (column 3, lines 10-23 of Hark). The water storage system of Rela is inherently pressurized to a given extent because water passing thereinto to the point of entry is a "municipal water stream", municipal water necessarily being under pressure to enable it's distribution to commercial and residential end point users.

Claim 22 and claims dependent therefrom, also differ in requiring that the regulating of electrical current of the EDI unit is regulated by a "controller". Rela teaches a water treatment system encompassing pretreatment filters comprising activated carbon filter or other sediment prefilter 10, reverse osmosis module 46 and electrochemical (EDI) unit 56, in which there is a controller or "control system" controlling the various water treatment units and also operative to regulate the current and power to the EDI unit (column 10, lines 18-28 and column 11, lines 7-57). Tamura teaches a controller to regulate feeding of chemicals to a reverse osmosis water treatment system (column 2, lines 60-62, etc.). Hark also discloses addition of treatment

chemicals through chemical adding means 19, 20 and 21 proximate reverse osmosis and EDI treatment units. It would have been further obvious to one of ordinary skill in the art to have included a controller for regulating addition of water treatment chemicals, operation of the reverse osmosis water treatment unit and EDI unit , as taught by Rela and Tamura et al, so as to operate the EDI unit and reverse osmosis filter units to provide optimal water quality and optimal operation.

Claim 22 further requires such controller to be able to regulate such current to be below a limiting current density to suppress hydroxyl ion generation. Batchelder teaches that EDI-containing water treatment systems are operated near or below the limiting current density, sometimes in combination with reversal of direction of the electric current (as in Batchelder) in order to mitigate the precipitation and deposition of minerals to contact surfaces (column 1, line 62-column 2, line 19 and column 4, line 42-column 5, line 2, etc.) Such actions are taught as reducing "water splitting" or formation of hydroxyl ions. It is noted that the water treated by Hark contains minerals among other contaminants (Hark at column 2, lines 33-45). More specifically, in column 8, lines 34-47 and column 12, lines 35-38 and 45-51, Batchelder explicitly teaches operating the anion exchange membranes of an electrodialysis or electrodeionizing device to have a reduced water-splitting capacity and to operate the cation exchange membranes of such device to have a relatively limited water-splitting capacity compared to enhanced water splitting membranes, with such objectives realized by limiting current densities.

Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces and downstream of the device especially in the concentrating stream, so as to optimize the EDI operation in removal of salts and other contaminants.

Batchelder also teaches that current densities achievable are necessarily limited by operating parameters of the EDI unit including thickness, structure of and diffusion rates through the membranes of the EDI unit and salt concentrations (column 1, lines 38-67). Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces, so as to optimize the EDI operation in removal of salts and other contaminants. It would have also been obvious that the EDI unit of Hark is only operable only at current densities up to a given limit, depending upon parameters of the construction and configuration of the EDI unit, as taught by Batchelder, thus water-splitting or hydroxyl ion generation is inherently "suppressed" or limited to a given extent.

It is noted that neither any of the claims, or the specification, quantify, or define a specific degree of hydroxyl ion suppression or quantify or recite a range of current density or limiting current density.

Regarding the limitation to a "reservoir system comprising a plurality of zones having water contained therein with differing water quality levels, Hark clearly discloses a system containing reservoirs and tanks and a plurality of water treatment units, the water treatment units and conduits therebetween defining zones of progressively more treated water, containing water of progressively higher water quality, respectively.

The claims all differ in requiring that the electrical current is maintained below a limiting current density to suppress hydroxyl ion generation. Batchelder teaches that EDI-containing water treatment systems are operated near or below the limiting current density, sometimes in combination with reversal of direction of the electric current (as in Batchelder) in order to mitigate the precipitation and deposition of minerals to contact surfaces (column 1, line 62-column 2, line 19 and column 4, line 42-column 5, line 2, etc.) Such actions are taught as reducing "water splitting" or formation of hydroxyl ions. It is noted that the water treated by Hark contains minerals among other contaminants (Hark at column 2, lines 33-45).

Batchelder also teaches that current densities achievable are necessarily limited by operating parameters of the EDI unit including thickness, structure of and diffusion rates through the membranes of the EDI unit and salt concentrations (column 1, lines 38-67). Thus, it would have been obvious for one of ordinary skill in the art to have controlled the EDI process in the Hark system by the controller, to be operating near or below the limiting current density to minimize excessive water splitting, or formation of hydroxyl ions, as taught by Batchelder, to further limit the amount of precipitation occurring on the EDI surfaces, so as to optimize the EDI operation in removal of salts and other contaminants. It would have also been obvious that the EDI unit of Hark is only operable only at current densities up to a given limit, depending upon

parameters of the construction and configuration of the EDI unit, as taught by Batchelder, thus water-splitting or hydroxyl ion generation is inherently limited to a given extent.

These claims also require the reservoir system being "fluidly connected" to the point of entry. The reservoir system of Hark is directly fluidly connected to the immediately upstream electrodialysis unit and indirectly fluidly connected to points further upstream including the potable water inlet point of entry to the entire system.

It is noted that neither any of the claims, or the specification, quantify, or define a specific degree of hydroxyl ion suppression or quantify or recite a range of current density or limiting current density.

Claim 28 further differs in requiring measuring of at least one water property in the reservoir system. Rela discloses a process combining activated carbon, reverse osmosis and EDI water treatment units, effective to reduce level of all impurities by a factor of approximately 700 upstream of the electrochemical device, resulting in water having very high resistance or very low conductivity (column 11, lines 54-65 and column 12, lines 8-12, respectively).

In Rela, various water properties are sensed/measured (pressure at column 6, lines 16-18, flow rate at column 6, lines 65-67 and ionic concentrations and temperatures in the feed water and throughout the system at column 8, lines 55-64 and sensed values are used by controllers to control flow rates of raw water, flow rates of the water being distributed to end use points, amount of current applied to the electrodeionization device and other system parameters (col. 4, l 43-67, col. 10. l 28-40, column 11, lines 7-57).

Tamura teaches water treatment system including activated carbon and other pre-filters and reverse osmosis treatment units in which water properties of pH are sensed (column 6, lines 23-37).

In summary, it would have been also obvious to one of ordinary skill in the art to have incorporated the monitoring and control taught by Rela and Tamura, into the Hark system, so as to optimize overall performance of the water treatment system including maintaining optimum flux and performance through the reverse osmosis units. Another motivation is to facilitate prompt and efficient maintenance and maintenance schedules for the various water treatment components.

(10) Response to Argument

With respect to all of the claims, it is argued that both Hark and Batchelder operate their EDI electrochemical devices so as to deliberately operate at a limiting current density effective to split water and form hydrogen and hydroxyl ions. Batchelder is also quoted as explicitly teaching to operate at the highest possible current density. It is stated that the references fail to provide any suggestion or motivation of a method comprising steps to suppress hydroxyl ion generation, while producing water.

In reply, it is submitted and emphasized that none of the claims quantify or define a specific degree of hydroxyl ion suppression or quantify or recite a range of current density or limiting current density. Recitation of current density being limited or hydroxyl ion generation or water-splitting being suppressed, do not constitute tangible, quantifiable claim limitations. The Specification fails to provide any guidance as to a limit or maximum current density, or a desired range or upper limit of water-splitting or hydroxyl ion generation. Hark is substantially silent as to operating current densities, and amount of water-splitting or hydroxyl ion generation maintained in an (electrodialysis) EDI electrochemical device. Batchelder teaches that EDI units are operated at "the highest possible current densities" that approach "the limiting current density (column 1, lines 65-67), thus hydroxyl ion generation and water-splitting are suppressed from what these parameters would be at a theoretically higher current density. Further, none of the claims contain any limitation precluding occurrence of water-splitting or there being a given amount of hydroxyl ion generation.

It is argued that neither Hark or Batchelder disclose introducing water from a point of entry into both a reservoir system as well as into an electrochemical device. It is submitted that the claims do not limit what is encompassed by the system containing the reservoir or preclude the electrochemical device from being a component of a larger system also encompassing the reservoir system, or the electrochemical device being either upstream or downstream of a system of components including a reservoir.

With respect to claims 3 and 8-10, it is argued that neither Hark or Batchelder disclose or suggest storing a portion of treated water in a pressurized reservoir system. Appellant's further assert that there is no disclosure in Hark of the treated water storage tank or reservoir being maintained at elevated pressure, rather depressurizes prior to introducing water into such tank. It is submitted that the pumps of Hark elevate the pressure across the entire disclosed system encompassing the tanks or reservoirs; there is no claim limitation requiring any particular pressure in a tank or reservoir, per se.

Arguments for claims 11,12,13 and 27 concerning whether the references suppress water-splitting or hydroxyl ion generation or suggest limiting current densities essentially repeat the arguments to the rejection of claim 1 and have already been addressed. It is further argued that Rela also does not suggest the argued limitations. However, it is further submitted that Rela was not relied upon for teaching these limitations. Rela is relied upon for control of an EDI device responsive to at least one measurement. The reliance upon Rela to teach control of amount of current applied to an EDI unit in response to sensing of water properties, does not negate the teachings of Batchelder regarding there being a current density limit or maximum current density operated by the EDI unit; also, "current" is not the same as "current density".

With regard to independent claim 4-7,11-20,22 and 27-32, argument concerning whether Tamura's teaching of regulation of pH of the concentrate from a reverse osmosis device repairs the rejection of claims 1 and 11 over Hark in view of Batchelder and Rela are not pertinent to other limitations of the claims. Tamura is strictly relied upon for teaching the regulation of such pH.

With regard to claim 17, it is argued that none of the references discloses a reservoir system comprising a plurality of zones of water having different water quality levels. It is submitted that "reservoir system" having a plurality of zones, as claimed, is not the same as would be a reservoir, having a plurality of zones. The primary reference, Hark, clearly discloses a system containing reservoirs and tanks and a plurality of water treatment units, the water treatment units and conduits therebetween defining zones of progressively more treated water, containing water of progressively higher water quality, respectively. Additionally in Hark, water passing into storage unit 24 is clearly more treated (by way of ultraviolet sterilization unit 18) than is water passing into storage tank 22.

With regard to claim 22, argument as to whether any of the prior art teaches a controller that is operable for regulating an electrical current to be below a limiting current density have substantially already been addressed in response to the arguments to rejection of claim 1.

With regard to claim 22, it is further argued that none of the references disclose or suggest there being a pressurizable reservoir system that is fluidly connectable downstream of a point of entry and further fluidly connectable upstream of a distribution system and associated point of use and also containing an electrochemical device. It is submitted that such claim language is not requiring any particular degree of pressure or pressure within a storage tank or reservoir, per se; the municipal water stream that passes into the point of entry of the primary reference Rela is necessarily pressurized to municipal water pressure. All of the references concern various pumps for further pressurizing the water.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Joseph Drodge/

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